L9 ANSWER 2 OF 3 CA COPYRIGHT 2005 ACS on STN
AN 127:142368 CA
ED Entered STN: 02 Sep 1997
TI Ion beam intermixing of semiconductor heterostructures for optoelectronic applications
AU Goldberg, R. D.; Mitchell, I. V.; Poole, P.; Labrie, D.; Lafontaine, H.; Aers, G. C.; Williams, R.; Dion, M.; Charbonneau, S.; Ramanujancha, K.; Weatherly, G. C.
CS Department of Physics, The University of Western Ontario, London, Ontario, Can.
SO Nuclear Instruments & Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms (1997), 127/128, 418-422
CODEN: NIMBEU; ISSN: 0168-583X
PB Elsevier
DT Journal
LA English
CC 73-10 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 76
AB The ability of radiation enhanced quantum well (QW) intermixing to produce active integrated photonic devices was demonstrated by the manufacture of a set of wavelength tuned lasers from a single semiconductor wafer. Defects, created in the InP-based structure by a high energy (1 MeV) P implant, enhance the diffusion of atomic species across the as-grown heterojunctions during subsequent rapid thermal annealing (90 s at 700°). As a result, the QW band gap energy is blue shifted with respect to unirradiated regions. It is shown that by implanting through a SiO2 mask of varying thickness, the bandgap of the QW can be selectively tailored across the wafer. Addnl. results from GaAs- and SiGe-based QW systems are presented to illustrate how bandgap engineering techniques may be improved through a better understanding of the defect interactions involved. In the GaAs-based structure, defect trapping at structural interfaces was identified as a possible hindrance to ion assisted intermixing. In contrast, data from the group IV QWs highlights the benefits of a low temperature (24 h at 630°) anneal prior to irradiation By removing defects from the as-grown material with **pre-annealing**, the relative bandgap shift induced by ion bombardment is doubled.
ST ion beam intermixing annealing quantum well; semiconductor laser ion beam intermixing; band gap tuning ion beam interdiffusion; phosphorus ion beam implantation quantum well
IT Diffusion
(interdiffusion; ion beam enhanced **quantum well intermixing** and annealing for band gap blue-shift in optoelectronic devices)
IT Band gap
Ion implantation
Quantum well devices
Rapid thermal annealing
Semiconductor lasers
(ion beam enhanced **quantum well intermixing** and annealing for band gap blue-shift in optoelectronic devices)
IT 7440-21-3, Silicon, uses
RL: DEV (Device component use); USES (Uses)
(ion beam enhanced **quantum well intermixing** and annealing for band gap blue-shift in optoelectronic devices)
IT 1303-00-0, Gallium arsenide (GaAs), properties 12623-04-0, Germanium silicide (Ge0.3Si0.7) 22398-80-7, Indium phosphide (InP), properties 106097-59-0, Gallium indium arsenide (Ga0.47In0.53As) 109414-09-7, Aluminum gallium arsenide (Al0.71Ga0.29As) 113172-24-0, Gallium indium arsenide phosphide (Ga0.26In0.74As0.57P0.43) 115454-37-0, Gallium indium arsenide (Ga0.79In0.21As)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)

(ion beam enhanced **quantum well intermixing** and annealing for band gap blue-shift in optoelectronic devices)

IT 7723-14-0, Phosphorus, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(ion beam enhanced **quantum well intermixing** for band gap blue-shift)

IT 7631-86-9, Silicon oxide (SiO_2), uses
RL: NUU (Other use, unclassified); USES (Uses)
(ion beam enhanced **quantum well intermixing** using silica mask for local band gap tuning)

RE.CNT 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD

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L9 ANSWER 3 OF 3 CA

AN 126:111557 CA
ED Entered STN: 18 Feb 1997

TI Effect of low-temperature **pre-annealing** on ion implant-assisted intermixing of Si1-xGex/Si quantum wells

AU Labrie, D.; Aers, G. C.; Lafontaine, H.; Williams, R. L.; Charbonneau, S.; Goldberg, R. D.; Mitchell, I. V.
CS Inst. Microstructural Sci., Natl. Res. Council, Ottawa, KA1 0R6, Can.

SO Applied Physics Letters (1996), 69(25), 3866-3868
CODEN: APPLAB; ISSN: 0003-6951
PB American Institute of Physics
DT Journal
LA English
CC 76-3 (Electric Phenomena)
Section cross-reference(s): 73

AB By using photoluminescence, the authors have studied the effect of a low temperature "pre-anneal" stage on the intermixing of 3-nm $Si_{0.7}Ge_{0.3}$/Si quantum wells implanted with silicon ions having energies up to 1 MeV and then exposed to rapid thermal annealing at 850° for 300 s. They find that an unwanted quantum well band gap increase in unimplanted samples after rapid thermal annealing can be reduced substantially from .apprx.30 to .apprx.5 meV due to the removal of grown-in defects by **pre-annealing** at 630° for 24 h. Pre-annealed samples that were implanted and rapid thermal annealed showed at least the same band gap increase (up to 70 meV in these samples) observed for non-pre-annealed samples. These results are understood in terms of significantly different activation energies for defect diffusion and **quantum well intermixing** and a nonlinear dependence of the

energy shifts on defect concns.

ST germanium silicon **quantum well intermixing**;
luminescence germanium silicon quantum well; annealing ion implantation
silicon germanium well

IT Annealing
Quantum well devices
(effect of low-temperature **pre-annealing** on ion
implant-assisted intermixing of Si1-xGex/Si quantum wells)

IT Luminescence
(of ion implant-assisted intermixed Si1-xGex/Si quantum wells)

IT 7440-21-3, Silicon, properties 12623-04-0, Germanium 30, silicon 70
(atomic)
RL: PRP (Properties)
(quantum wells; effect of low-temperature **pre-annealing**
on ion implant-assisted intermixing of Si1-xGex/Si quantum wells)

RE.CNT 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

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L2            342 QUANTUM (A)WELL(A)INTERMIXING
L3            367 L1 OR L2
L4            314 PRE-ANNEALING OR (PRE(A)ANNEALING)
L5         116382 DEFECTS
L6             13 L4(20A)L5
L7              0 L3 AND L6
L8              0 L3 AND L4

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☐	L48	chnadra.xp.	0
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☐	L25	ni or nickle	410173
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☐	L23	L22 and l22	345383
☐	L22	strain	345383

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☐	L19	l1 same l14	40
☐	L18	L17 and l10	2
☐	L17	patterned adj mask	5932
☐	L16	patterned adj mask	10
☐	L15	l14 and l13	9
☐	L14	defects	412202
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☐	L12	l2 and l11L11	0
☐	L11	quantum adj well	18041
☐	L10	l2 and l1	6
☐	L9	L8 and l1	38
☐	L8	l6 same l4	7034
☐	L7	L6 and l5	48
☐	L6	defect$5	537557
☐	L5	L4 and l1	70
☐	L4	$4annealing or (pre adj annealing)	162734
☐	L3	L2 and l1	6
☐	L2	PRE-ANNEAL$4	920
☐	L1	qwi or (quantum adj well adj intermix$5)	138

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